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Faculty of Natural Resources and Agricultural Sciences

Farmland in municipal physical planning

- A production perspective of farmland conversion

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Department of Urban and Rural Development
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- A production perspective of farmland conversion

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Abstract

During a relatively short time period Sweden has experienced a significant decrease in farmland area: between 1951 and 2010 over 1 million hectares was put out of production. Most of the decrease in farmland area can be ascribed to conversion into forest plantation or unintentional overgrowth of some form, and only 10 – 15% is due to development projects such as housing, business facilities and infrastructure. There is however a fundamental difference between farmland overgrowth and urban development on farmland, namely that the former is a reversible process whereas urban development is practically irreversible. The decrease in farmland along with a population growth has radically changed the possible rate of national self-sufficiency: Sweden utilizes food products corresponding to roughly 0,41 hectares per capita whereas on a national level there is only access to 0,28 hectares. The conversion of farmland is governed by the environmental code and the task of managing issues of farmland conversion lies solely on individual municipalities and there is no national coordination in the matter. Furthermore, there are reports that point to shortcomings in the municipal application of the environmental code, specifically in the comprehensive plan, and the need for stronger protection of farmland. As such this study aims to explore the possibilities for the already ascribed legal protection of farmland to function within municipal physical planning, with a focus on the comprehensive plan. To fulfill this aim the study takes on a literature review, a review of municipal planning documents and an interview study. The results show that there are large disparities between the management of farmland in the actual comprehensive plan and the knowledge and beliefs of individuals involved in the planning process, that there are significant perceived difficulties in valuing farmland and that the application of the environmental code is insufficient to protect farmland.

Keywords: cropland, comprehensive plan, environmental code

Sammanfattning

Under en relativt kort period så har Sverige upplevt en drastisk minskning av jordbruksmark: mellan 1951 och 2010 så har over 1 miljon hektar jordbruksmark tagits ut produktion. Den större andelen av minskning kan tillskrivas skogsplantering och oavsiktlig igenväxning I någon form, och endast 10 – 15% beror på byggnation av t.ex. bostäder, affärslokaler och infrastruktur. Det finns dock en fundamental skillnad mellan skogsplanterad eller igenväxt jordbruksmark och bebyggd jordbruksmark, nämligen att den förra typen av omvandling är en reversibel process medans byggnation av jordbruksmark i praktiken är en irreversibel process. Minskningen av jordbruksmark, tillsammans med befolkningsökningen, har radikalt förändrat den potentiella graden av självförsörjning: Sverige utnyttjar livsmedel motsvarande ungefär 0,41 hektar per capita medans det på en nationell nivå endast finns tillgång till 0,28 hektar. Exploatering av jordbruksmark regleras av miljöbalken och hanteringen av frågor angående exploatering av jordbruksmark åligger enbart de individuella kommunerna, utan någon nationell samordning. Vidare så pekar ett antal rapporter på brister i den kommunala tillämpningen av miljöbalken, särskilt i översiktsplaner, och på behovet av starkare skydd av jordbruksmark. Denna studie fokuserar således på möjligheterna för det redan tillskrivna skyddet av fungera inom ramen av kommunal fysisk planering, med fokus på översiktsplanen. För att uppfylla denna målsättning genomförs en litteraturstudie, en studie av kommunala översiktsplaner och dess tillhörande miljökonsekvensbeskrivning, samt en intervjustudie. Resultaten av studien pekar stora skillnader mellan hanteringen av jordbruksmark i de faktiska planeringsdokumenten och kunskapen och övertygelserna hos individer inblandade i planeringsprocessen, att det finns avsevärda uppfattade svårigheter med att värdera jordbruksmark samt att tillämpningen av miljöbalken är otillräcklig för att skydda jordbruksmark.

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1. Introduction

In an historical perspective agriculture played a vital role in urbanization processes, providing the foodstock surplus necessary to sustain larger and denser populations. With transports, especially long distance transports of food being highly impractical or even impossible, the closeness of fertile farmland was a prerequisite for cities to arise. From the first cities of the Indus valley and Mesopotamia to the much later European expansion the same principle applies, and Sweden constitutes no exception (McKay et al., 2009, Swedish board of agriculture, 2013a). With technological progressions facilitating transportation, population centers evermore distant from agricultural districts have been made possible. However, to a large extent these historically agriculturally dependent agglomerations still prevail today and in Sweden constitute the larger and more expansive cities (Swedish board of agriculture, 2013a).

Since the very beginning of agriculture in Sweden, almost 6000 years ago, the area it occupied increased up until it peaked in the early years of the 20th century, and ever since there has been a general successive decrease of farmland (Swedish Environmental protection agency, 2009). At most there has been roughly 5 million hectares of farmland in Sweden, of which 3,8 million hectares was cropland and 1,2 million hectares was pasture (Statistics Sweden, 2013). From 1900 up until 2010 the cropland area has decreased with over 1 million hectares, whilst the area of pasture was at its lowest point around 1970 followed by a slight increase and subsequent stabilization at about 500.000 hectares with only minor variations since (Statistics Sweden, 2013). The reason for this was a significant increase in yields facilitated by technological progression providing farmers with new tools and machines, improved drainage, plant breeding and new varieties, and the use of commercial fertilizers (Swedish Environmental protection agency, 2009). Post World War II the significant increase in use of commercial fertilizers, the widespread introduction of fossil fuel driven machinery and the increasing use of pesticides and herbicides steadily increased the yields for the remainder of the century (Swedish Environmental protection agency, 2009).

As a result of soaring yields following agricultural development, a situation of overproduction arose as the population and its demand for food didn't increase correspondingly. However, for much of the 20th century farming has been protected by price regulation and import duties. Following the depression of the 1930's, when demand for foodstuffs declined as a result of dwindling incomes, the government introduced price guarantees for certain food categories and import duties on foreign foods. The reason behind this form of protection was to safeguard domestic food production capabilities in case of any type of disruption in international trade (Swedish Environmental protection agency, 2009). Post World War II the price guarantees was expanded to more categories, and the protection of farming continued to have strong support. As such the protection had become permanent, and the function by which the market regulates overproduction had been put out of play (Swedish Environmental protection agency, 2009).

And in order to curb overproduction, the "food production should be rationalized, primarily through closure or consolidation of the nation's many smallholders" (Swedish Environmental protection agency, 2009). Indeed small scale farmers were disadvantaged by the period of intensification via relatively heavy investments post World War II and many smaller farms were closed or consolidated into larger more expansive farms, and as a result the second half of the

20th century saw a rapid urbanization at the expense of rural depopulation. The general process of urbanization along with an overall increase in social and economic standards during this period led to a physical expansion of Swedish urban areas (Swedish Environmental protection agency, 2009; Swedish board of agriculture, 2013a).

The intensification of agriculture and the closure of large numbers of small scale farms resulted in significant amounts of farmland being put out of production and overgrown, intentionally or unintentionally, and a stream of urban migration that still is ongoing has led to expansive city regions that compete with agriculture over land (Swedish Environmental protection agency, 2009; Swedish board of agriculture, 2013a). Since populous areas often are situated on arable land there is an inherent societal conflict of interest between urban areas and agricultural land. This conflict is particularity visible in populous areas that are expansive: subject to urban migration. In such areas, municipalities are faced with a growing population and limited amounts of residences, areas for business development and infrastructure to sustain its growing population. As such, the neighboring farmland is threatened by urban expansion. Hereafter, when not specified, all forms of agricultural land regardless of production form, purpose and whether it is or is not presently farmed/cultivated/grazed etc. will be referred to as *farmland*. When necessary, two types of farmland will be distinguished: cropland and pasture. Cropland refers to farmland that is ploughed, and pasture refers to farmland not being ploughed.

The issue of farmland loss was raised during the 1970's period of large farmland losses (Proposition, 1972:111), and has gained more attention once again in recent years, especially as a result of the report *Väsentligt samhällsintresse?* (Essential societal interest?) by the Swedish board of agriculture (2013a). The report points primarily to shortcomings in the municipal application of the environmental code chapter 3, section 4 in their comprehensive plans (CP). Even though not being a legally binding planning document, the CP has a fundamental function as it sets forth the overall direction for a municipality. As highlighted in the report, the values attributed to farmland and the focus of farmland preservation has been on biodiversity and cultural aspects, whereas production related aspects have received significantly less attention. Furthermore, municipalities themselves state that to assess the value of biodiversity and cultural aspects of farmland is perceived as significantly easier than to assess production related aspects of farmland (Swedish board of agriculture 2013a).

1.1. Purpose and research question

The issue of farmland conversion into urban areas has recently been highlighted and several reports point towards the need for more stringent legislation in order to protect farmland. However, the purpose of this thesis is to explore the possibilities for the already ascribed legal protection of farmland to function within municipal physical planning. This thesis takes the perspective of the Swedish board of agriculture (2013a), that the CP is the decisive level of planning in issues of farmland conversion. In order to fulfill its purpose this thesis aims to answer 2 sub questions:

- How are municipalities handling issues regarding farmland in their comprehensive plans?
- What forms of perceived difficulties are there in valuing farmland?

The purpose of this study is not to perform comparisons between individual municipalities, even though it to a smaller indirect extent will be done anyway.

2. Method

This study focuses on six municipalities (figure 1) to investigate how farmland is handled in their respective comprehensive plan and their corresponding environmental impact assessment. The municipalities are all unique and there are differences in size, population, density, amount and ratio of farmland etc. This does not however constitute a problem, as the focus of this study is the handling farmland in physical planning, the weighting of interests, and understanding of related environmental issues that are of interest; and as such the diverse group of municipalities will shed more light on different aspects of the issue. The common link between all chosen municipalities is that they have a relatively large proportion of quality farmland (there are however significant differences in cropland class between the municipalities) and that they are expansive, suggesting that they commonly/frequently have to deal with issues of farmland conversion in their physical planning processes. The municipalities have been chosen by identifying larger urban areas within areas indicated by the Swedish board of agriculture (2013 b) as having a high rate of farmland conversion in the period 2006 - 2010. The urban regions Stockholm and Gothenburg has been left out of this study due to the multi-municipality structure of these areas, not representative of Swedish municipalities. Furthermore, the role of the county administrative board (CAB) will be investigated. As such, each municipality's CP's corresponding CAB review statement has been investigated.

This study is primarily based on a qualitative methodology, though statistical data to a certain extent has been used to substantiate specific arguments. The study is founded on a literature review of government reports and investigations, legal documents, propositions and relevant research. From the literature review a number of criteria's important for farmland preservation was identified and used in the review of the CPs and EIAs via a qualitative systematic review. When reviewing the CPs and EIAs statements relating to the identified criteria's was searched for, and whether the stated criteria's was fulfilled or not was subsequently assessed. Not entirely fulfilled criteria's was ignored. The review of the CPs and EIAs was done by using the same principle applied by the Swedish board of agriculture (2013a): using search words to navigate to relevant sections of the plans, which then were read. The search words used was: *jordbruk**, *åkermark*, *bete** and *generation**. The asterisk marks alternative endings to the words. The reason for searching for '*generation**' is that the generational goal and its meaning for farmland management necessarily wouldn't need to be written in conjunction with questions relating to farmland, and would as such not be found when searching for farmland related terms. The review of the CAB review statement was not done by the word search applied to the CPs and EIAs; the review statement is a rather short document and unlike the CPs and EIAs relatively lucid and transparent and was as such read in its entirety for the review. The CAB statements were reviewed by looking for any comments relating to farmland, and to assess what those comments entailed. From the literature and the results of the CP/EIA review 3 sets of interview questions was designed to target CP, EIA and CAB respondents. The interview respondents were identified via using the contact person/persons given in the CPs and/or EIAs or the webpages of the corresponding municipalities. In some cases the contact person was interviewed and sometimes

the contact person gave another recommendation for respondent. In two cases the given contact persons was not reachable, in which cases the municipal information desk was asked to provide an initial contact within the municipality, whom provided recommendations for respondents. The CAB respondents were identified by contacting the information desk, stating the topic, and asking for a suitable contact. In some cases the initial contact would be the respondent and sometimes they referred to another contact. The interviews were conducted in a semi structured manner where the pre-designed interview questions was asked in a particular order, but the respondents was given unlimited leeway in their answers and to any specifics they whished to discuss in conjunction to any question asked.
From these 3 levels of data (literature review, review of the CPs and EIAs and the interviews) an analysis was performed, which aims to highlight similarities and disparities between believes and knowledge and practice, the meaning and significance of legislation and the municipal and CAB view, interpretation and application of the legislation,

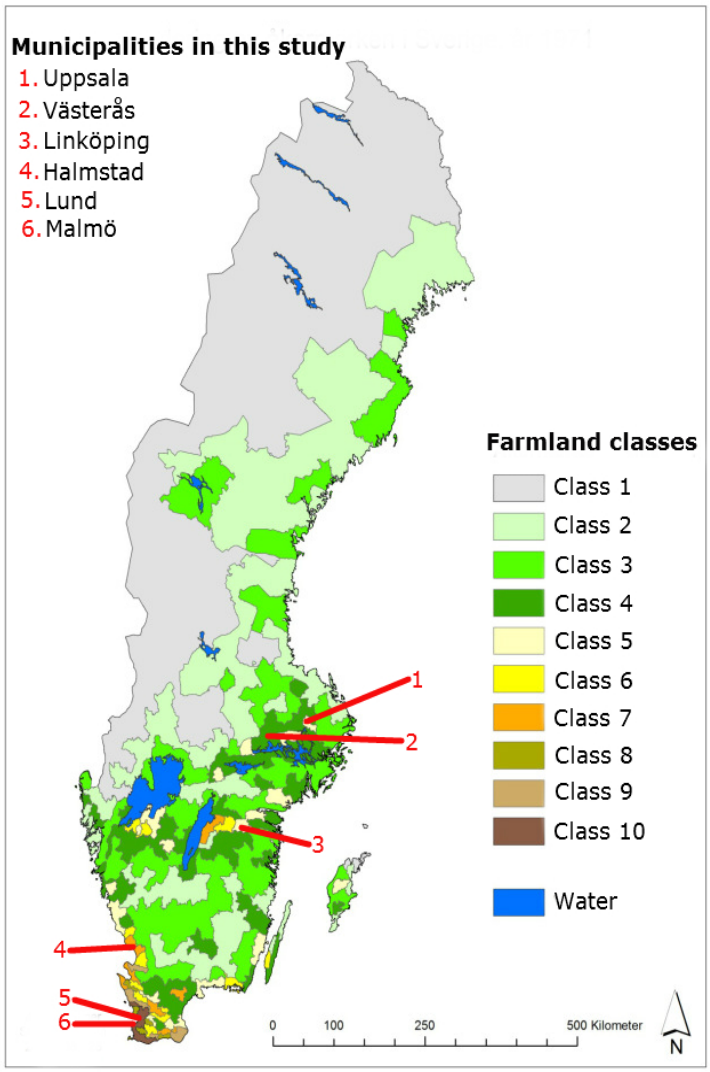


Figure 1. Municipalities in this study and the allocation of farmland classes. (Source: Johan Holmer, Swedish board of agriculture 2013)

2.1. Delimitations

At the core of the issue there is an inherent fundamental conflict between two general objectives of comprehensive plans: to continue to grow and to be sustainable. At a point where even a stabile population would not be sustainable, the objective of continued growth most certainly counteracts the second objective of sustainability. However, this state of things is related to both demographics and the predominant economic doctrine and is not the issue of this thesis and will as such be treated as a fact and not a variable.

As the CP is the overarching plan that subsequent, more detailed plans are based on this thesis will focus only on the CP and its environmental impact assessment and no other municipal plans, programs or policies will be investigated. With regards to the legal framework, there are several laws and regulations that interconnect, but this thesis will mainly focus on the legal basis found in the environmental code. Other laws and regulations will be mentioned only as needed for the reader to understand the context. As the Swedish board of agriculture (2013) found in their report that cultural and biodiversity aspects of farmland protection was perceived as easier the value and/or assess, this thesis will not focus on these 2 issues of farmland preservation/conversion. With regards to the role of the CAB only the review statements will be investigated (not consultation statements).

For this study only areas with a cropland classification of >3 was in question. Furthermore, no municipality with a CP older than 5 years was to be included in this study.

3. Literature review

This chapter covers legislation and environmental policy, government reports and research relevant to the issue of farmland conversion.

3.1. The planning system

In Sweden farmland has no national protection, and issues of farmland protection/conversion are handled in the municipal planning process. The overarching municipal planning tool is the CP which according to the planning and building act 'shall outline the orientation of the long-term development of the physical environment' (SFS 2010:900 Chapter 3, Section 2). As such, more detailed plans are derived from- and should conform to the CP. However, the CP is not a legally binding document and as such the conformity is not a legal requirement but common practice, and there are specific processes that (to the CP) non-conforming plans are subject to (SFS 2010:900). Furthermore, the CP was identified by the Swedish board of agriculture (2013 a) as the decisive planning tool to primarily focus on if farmland protection is to function.

As stated in the environmental code (SFS 1998:808) and the ordinance on environmental impact assessments (SFS 1998:905), the establishment of a comprehensive plan requires the municipality to perform an environmental assessment and to prepare an environmental impact assessment (EIA). The environmental assessment should be viewed as a process or procedure of incorporating environmental aspects into the plan, whilst the EIA is a/the physical document describing the environmental impacts of the plan.

Chapter 6 of the environmental code (SFS 1998:808) governs the contents of EIAs, and 4 of the sections are of particular interest to this study:

- Section 12 states what an EIA should contain expressed in 10 points.
- Section 13 states that an EIA should contain the information stated by section 12 with regards to:

1. assessment methods and current knowledge
2. the contents and level of detail of the plan or program
3. where in the decision process the plan or program is
4. that certain issues can be assessed better in conjunction with the review of plans and programs or permit applications of operations and activities, and
5. public interest

- Section 15 states that if the adoption of a plan or program can be assumed to entail significant environmental impacts in another country, the controlling authority or the government shall send the description and the proposal to the concerned nation.
- Section 21, 2 states that if the situation arises, state authorities shall report to the government of the need for municipal reporting with regards to the management of land and water resources.

When a CP (including it's EIA) is established the CAB are according to Swedish planning and building act (SFS:2010:900) required to give a review statement focusing primarily on 5 points known as *grounds for revision* (referring to the CABs authority to stop a local plan):

1. National interests as given by chapter 3 and 4 of the environmental code (SFS 1998:808). The national importance ascribed to farmland by this section does not constitute a national interest.
2. Environmental quality standards as given by chapter 5 of the environmental code (SFS 1998:808).
3. Rural development in waterfront locations as governed by chapter 7, section 18 of the environmental code (SFS 1998:808).
4. Regional coordination in issues of land and water utilization.
5. Health, safety and risk elements associated with urban areas or individual constructions.

However, the above points are what is required to be included and in addition to these the CAB are free to comment on other aspects of the CP.

3.2. The environmental code

The opening section of the environmental code, chapter 1, section 1 states that : 'The purpose of this code is to promote sustainable development which will assure a healthy and sound environment for present and future generations. Such development will be based on recognition of the fact that nature is worthy of protection and that our right to modify and exploit nature carries with it a responsibility for wise management of natural resources.

The environmental code shall be applied in such a way as to ensure that:
1. human health and the environment are protected against damage and detriment, whether caused by pollutants or other impacts;
2. valuable natural and cultural environments are protected and preserved;
3. biological diversity is preserved;
4. the use of land, water and the physical environment in general is such as to secure a long term good management in ecological, social, cultural and economic terms; and
5. reuse and recycling, as well as other management of materials, raw materials and energy are encouraged with a view to establishing and maintaining natural cycles' (SFS 1998:808 chapter 1, section 1). This section provides clear guidance as to the application of the environmental code, and emphasizes a long term approach to both environmental issues in general and to the use of land.

As given by chapter 2, section 2 of in the planning and building act (SFS 2010:900) the provisions on management of land and water areas in chapters 3 and 4 of the environmental code should be applied to planning processes. With regards to farmland specifically this refers to chapter 3, section 4:

> *'Jord- och skogsbruk är av nationell betydelse.*
> *Brukningsvärd jordbruksmark får tas i anspråk för bebyggelse eller anläggningar endast om det behövs för att tillgodose väsentliga samhälls-intressen och detta behov inte kan tillgodoses på ett från allmän synpunkt tillfredsställande sätt genom att annan mark tas i anspråk.'*
>
> *'Agriculture and forestry are of national importance.*
> *'Agricultural land that is suitable for farming may only be used for development or building purposes if this is necessary in order to accommodate significant societal interests and this need cannot be met satisfactorily from the point of view of public interest by using other land.'* (Chapter 3, section 4 of the Swedish environmental code (1998:808) and English translation made by the author).

In this section governing the management of farmland there are three terms that are crucial to the actual application of the code in physical planning. As illustrated by the Swedish board of agriculture (2013a) the definition (or degree of definition) and application of these terms vary widely amongst Swedish municipalities, resulting in equally varying planning decisions with regards to farmland.

- The term *agricultural land suitable for farming* refers to 'land that with regards to location, characteristics and other preconditions are suitable for agricultural production' (Proposition 1985/86:3, p. 158).

- The term *essential societal interests* lack a definition, thus the task of defining and applying the term is given to the individual municipalities without guidance (Proposition 1985/86:3; Swedish board of agriculture, 2013).
- The term *satisfactorily* refers to what is 'fully acceptable from a standpoint of societal development' (Proposition 1985/86:3, p. 158)

Naturally, the two terms with definitions are also open to a wide range of interpretations as they merely provide fundamental guidance for further definition by individual municipalities.

Of further interest to this study is also chapter 3, section 1 of the environmental code that states that 'Land and water areas shall be used for the purposes for which the areas are best suited in view of their nature and situation and of existing needs. Priority shall be given to use that promotes good management from the point of view of public interest' (SFS 1998:808).

3.3. National environmental policy

Sweden has constructed a platform, in the form of an environmental objective system, common to all actors involved in environmental efforts. The platform comprises 3 levels of objectives/goals: The Generational goal, The Environmental Quality Objectives and Milestone Targets. The generational goal is Sweden's overarching objective for environmental policy and it should be indicative for all levels of environmental efforts, and as such superior to the environmental quality objectives and milestone targets (Proposition 2009/10:155). In 2010 the generational goal was changed into its present form, adding to it the clear international focus (Proposition 1997/98:145; Proposition 2009/10:155).

> *'The overall goal of Swedish environmental policy is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders'* (Proposition 2009/10:155, p. 21).

In the context of farmland conversion the international perspective is of interest as land use in Sweden, as stated by the All party committee on environmental objectives (Miljömålsberedningen), is 'affected by i.a. global consumption patterns, demographics, globalization and technology development' (SOU, 2014:50 p. 56).

Stemming from the generational goal are the 16 individual environmental quality objectives:

- Reduced Climate Impact
- Clean Air
- Natural Acidification Only
- A Non-Toxic Environment
- A Protective Ozone Layer
- A Safe Radiation Environment
- Zero Eutrophication
- Flourishing Lakes and Streams

- Good-Quality Groundwater
- A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
- Thriving Wetlands
- Sustainable Forests
- A Varied Agricultural Landscape
- A Magnificent Mountain Landscape
- A Good Built Environment
- A Rich Diversity of Plant and Animal Life

The main connection to farmland is naturally *A Varied Agricultural Landscape* which is specified to mean that '…the value of the agricultural landscape and farmland for biological production and food production shall be protected while the biodiversity and cultural environment are preserved and strengthened' (Proposition 1997/98:145, p. 108). However, the application of the environmental target has so far mainly been focused on biodiversity and cultural values and issues of food- and biological production have been largely overlooked (Swedish board of agriculture, 2013b). A reason for this (to some extent) is that there is no specification relating directly to this part of the objective (Proposition 2009/10:155; Swedish board of agriculture, 2013b). Factors affecting the production are primarily land conversion, but also soil compaction and heavy metals, and as a result the Swedish board of agriculture in 2011 recommended the government to amend the objective specification to include a minimum requirement of 2,6 million hectares of available cropland (Swedish board of agriculture, 2013b). This national policy is of great interest to this study as a CPs effect on objectives and goals of the national environmental policy shall in accordance with chapter 6, section 12 of the environmental code (SFS 1998:808) be describes in such a plans accompanying EIA.

3.4. Cropland classification in Sweden

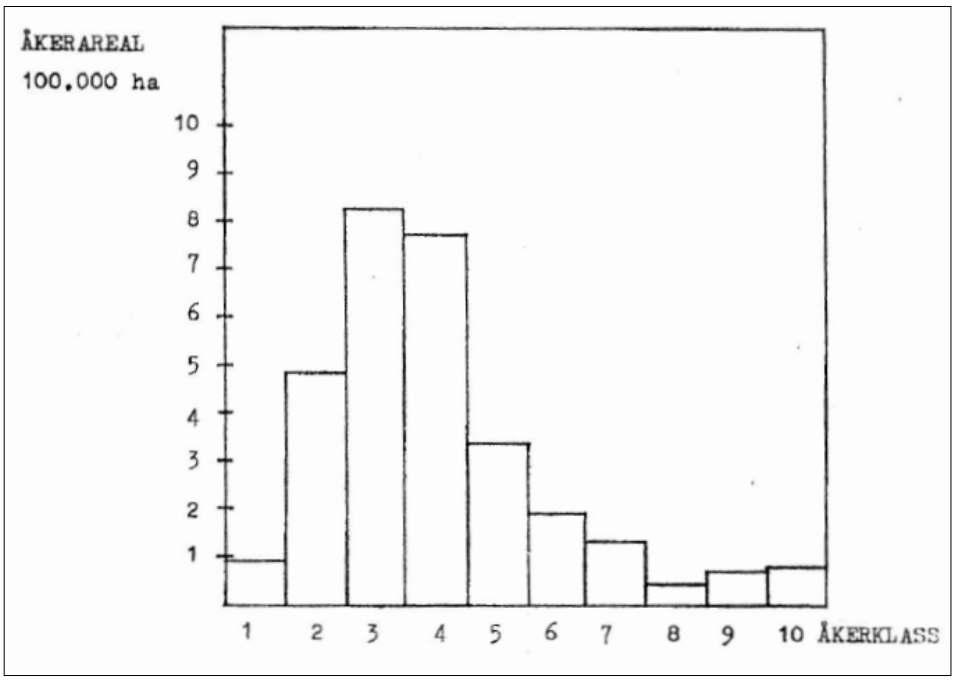
A common way of establishing the value of farmland is to refer to its class as determined by the Cropland classification. In 1971 Kungliga Lantbruksstyrelsen (discontinued in 1991 and its duties transferred to the Swedish board of agriculture) published a memorandum containing a classification of Swedish cropland. It divides the farmland into 10 classes, with 1 being the lowest and 10 being the highest (best). The cropland classification is structured per the 421 (1969) compensation-areas designated within the Swedish crop-damage protection program. These areas in turn were formed with regards to general agricultural conditions such as soil characteristics, climate and crop orientation. The aim of the classification was to express the economic production value of farmland in order to facilitate planning decisions in the face of growing pressure on land, and to this day the classification is utilized for this purpose (Kungliga Lantbruksstyrelsen, 1971). The classification is based on statistical and empiric assessments. The statistical data represents the basis of the classification, whilst the empiric assessments could be decisive in cases when there was larger consensus among analysts that the statistical assessment should be amended. The empiric assessment is based on local expertise with regards to 'agricultural conditions, cropland density as well as physical structure and economic location of cropland' (Kungliga Lantbruksstyrelsen, 1971). The statistics are based on the economic value of yields from crops included in the previously mentioned crop-damage protection program and

no consideration is given to crops omitted in the program. The classes are given by an amended standard yield value expressed as SEK per hectare. The statistical calculation is as follows:

$$\boldsymbol{AX = X - (Y \cdot X) - (PD \cdot CPD^{*}) - (PP \cdot CPP) - (SB \cdot CSB) - CR^{*}}$$

Where:
AX: amended standard yield value SEK/ha
X: standard yield value for a given compensation area in SEK/ha (as given by Statistics Sweden)
Y: percentage of farmland lying in fallow
PD: percentage of farmland used for producing potatoes for direct consumption
CPD: additional costs incurred by producing potatoes for direct consumption in SEK/ha (region dependent)
PP: percentage of farmland used for producing potatoes for processing
CPP: additional costs incurred by producing potatoes for processing in SEK/ha
SB: percentage of farmland used for producing sugar beets
CSB: additional costs incurred by producing sugar beets in SEK/ha
CR: additional costs incurred with regards to agricultural region in SEK/ha (in relation to the northern regions=0)
*****: Region dependent variable

The amended standard yield value is then directly used for classification by dividing the range of yield values per hectare into classes of 130 SEK respectively: producing a scale of 10 classes of Swedish farmland and distribution thereof (Fgure. 2).



Figur 2. Original chart with distribution of farmland classes (X axis) per 100.000 hectares of farmland (Y axis) included in the Swedish crop-damage protection program in 1969 (Source: Kungliga Lantbruksstyrelsen, 1971)

The statistical calculation for the classification is based on data for two years (1968 and 1969), and in certain cases just one (1969) due to changes in the compensation-area design (Kungliga Lantbruksstyrelsen, 1971)

Connected to the use of the cropland classification is that in a governmental investigation published in 1971 it was recommended for municipalities to in situations of conflicting land use interests, perform more detailed cropland classifications (SOU 1971:75).

3.5. The potential and preconditions of Swedish farmland

Farmland in Sweden has a generally high quality in a global context. However, the total area of high quality farmland is small in relation to total land area, rendering Sweden characterized by major geological differences between farmland and other land (SNA, 2009; Statistics Sweden, 2013a). In a global perspective, Scandinavia are among the rather few regions where farmland is not exposed to large scale erosion processes, reducing its potential (Hudson, 1995). Accordingly, this entails a relative increase in value and/or importance over time for Swedish farmland, regardless of climate change impacts on agriculture. With regards to climate Sweden has fair conditions for agriculture, with the length of the vegetation period being the primary limiting factor (SOU 2007:60).

3.6. Loss of farmland and farmland today

Farmland overgrowth, intentional or unintentional, has during the past been the main reason for the large decrease, corresponding to 85-90 % of the total area of farmland lost (Statistics Sweden, 2013). In view of the total decrease of farmland area, urban expansion has only contributed to a smaller portion: from 1960 up until 2010 urban expansion has claimed 67.554 hectares of cropland (there are no available figures for pasture) (Statistics Sweden, 2013). This form of land conversion is however particularly troublesome for two main reasons: 1) Many of the expansive cities in Sweden are located in areas with the best farmland in the country, and the total area of farmland with such good soils is very limited; 2) when converting farmland into urban areas the rich/nutritious topsoil is removed and in many cases used for landscaping purposes, and the remaining soil is prepared and compacted to such an extent that even if the urban structure was removed there is no realistic way of converting the land back into agricultural production (EEA, 2006; Swedish board of agriculture, 2013a; Swedish board of agriculture, 2013b).

Today (2010) Sweden has access to roughly 3,1 million hectares of total farmland and 2,6 million hectares of cropland, corresponding to 0,33 and 0,28 hectares of per capita respectively (Statistics Sweden 2015a; Statistics Sweden 2015b). There is a very important difference between these two measures of agricultural land, namely that cropland represents the absolute majority of food production save a few percent (Johansson, 2005). Hence, from a production viewpoint it is the cropland that is of primary interest. The global average of cropland per capita is significantly lower than that of Sweden: 0,22 hectares (Statistics Sweden, 2013). However, whilst Sweden has access to roughly 0,28 hectares of cropland per capita we are in practice consuming food products corresponding to around 0,41 hectares (1997-2000) (Johansson, 2005). From 1951 to

2010 the per capita area of cropland in Sweden has decreased from 0,51 to 0,28, not only due to farmland put out of production but also a significant increase in population (Figure 3 & 4) (Statistics Sweden 2015a; Statistics Sweden 2015b). During that same period the cereal yield per hectare has seen the opposite trend, moving from the 1960's average of 2920 kg to the 2000's average of 4744 kg, an increase of 62% (World Bank, 2015).

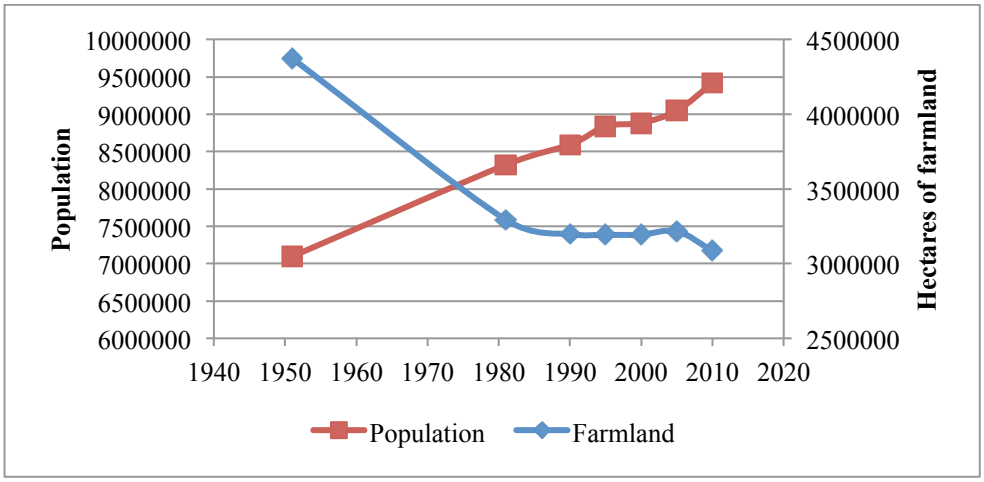


Figure 3. The development in population and area of farmland available (Statistics Sweden, 2015a; Statistics Sweden, 2015b).

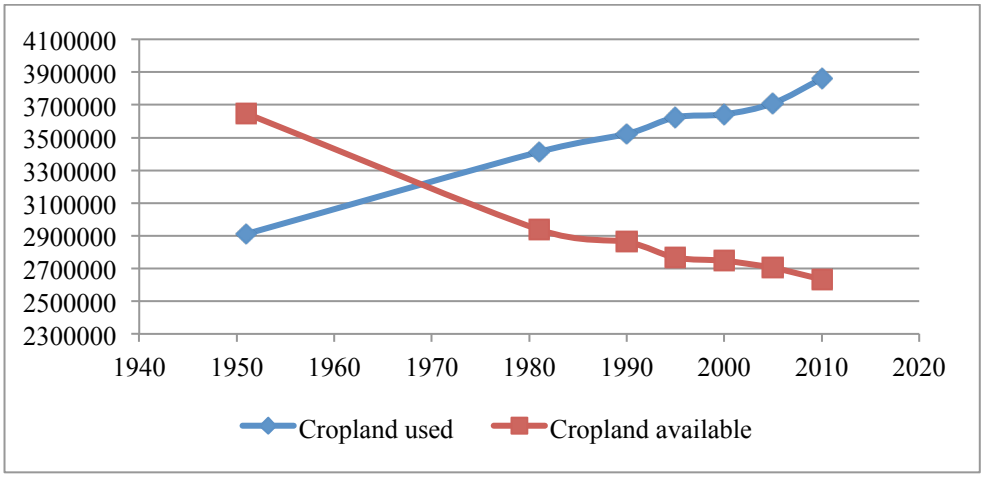


Figure 4. Hectares of cropland used in relation to the availability of cropland in Sweden under a static land use per capita of 0,41 hectare as calculated by Johansson (2005) (Statistics Sweden, 2015a; Statistics Sweden, 2015b).

Farming in Sweden and in much of the industrialized world today is highly specialized (Swedish Environmental protection agency, 2009) and dependent on long range transportation e.g. the grain import to European animal production. This development has implications on the nutrient cycle, the spreading of disease, the use of antibiotics, the use of herbicides and pesticides and GHG-emissions (SOU 2005:51).

3.7. Changing conditions

Today the world is faced with growing populations and increasing resource demand along with climate change and related uncertainties to future capabilities of food production (FAO, 2009; Godfray et al., 2010; Swedish board of agriculture, 2013a; SOU 2014:50). The scenarios for the outcome of these climate changes vary. Many of the areas that today are highly suitable for agriculture will be impacted negatively and the food production in these areas will as a result decrease. It can however be stated that Scandinavia is one of the areas that with regards to food production capabilities will be impacted in a generally positive way in the form of primarily a northward movement of the agricultural zones (SOU 2007:60; Swedish board of agriculture, 2007; Beck, 2013).

The actual and precise outcome of climate change and the impact that it will have in agriculture is unknown, but via modelling certain predictions can be made. First of all, almost all models under different climate scenarios predict a decrease in production capabilities on a global scale. Secondly, many regions predicted to experience adverse effects on agriculture are at present significant producers of food. Thirdly, many regions predicted to be severely affected by climate change are poor regions less equipped to offset the effects of climate change (Parry et al., 2004; Beck, 2013). Considering these outlooks, food security, a term often used in relation to developing countries struggling to feed its population, could also be useful in the context of Sweden and farmland conversion issues. In the light of climate change and global scenarios for future food production, food security could become an issue in Sweden due to its heavy dependency on imported food (Johansson, 2005; FAO, 2009; IFPRI, 2009; SOU 2014:50; Statistics Sweden, 2015a; Statistics Sweden, 2015b; Statistics Sweden, 2015c). With an uncertain future of fossil fuel production capabilities and policies pushing biofuels there is increasing pressure on farmland as a producer of energy crops. Considering the fact that there is not nearly enough farmland available for Sweden to be self-sufficient on food, an increase in biofuels demand would decrease the amount of farmland available for food production (SOU 2007:60; FAO, 2009).

3.8. Farmland conversion

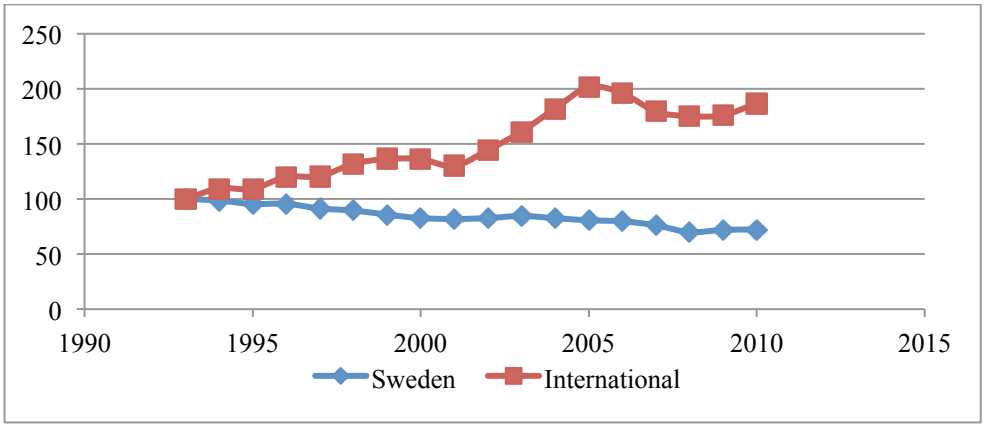
For construction purposes the soil is compacted to provide stability and prevent subsidence. The compaction and subsequent weight and pressure of the construction render the soil unfit for agriculture, should the construction be demolished (EEA, 2006; Swedish board of agriculture, 2013a; Swedish board of agriculture, 2013b). As such, converting farmland into an urban area is practically an irreversible process. In comparison, any farmland overgrowth is not a threat to the potential future agricultural needs, as these areas can be returned into agricultural production (Swedish board of agriculture, 2013a). To accommodate future food production there is a possibility of increasing food production capabilities by converting forests into farmland. However, this solution is not entirely non-problematic since it interferes and impedes forestry which is of national importance (SFS 1998:808)

3.9. Food import and transportation/freight

Out of the total amount of food being consumed in Sweden an increasing share is being imported (SOU 2005:51). The transportation of these imported food products has environmental impacts on global, national and local perspectives. The environmental impact is not linear to the distance transported but rather dependent on the form of transportation. A given product transported *X* kilometers could have less environmental impact than the same product transported <*X* kilometers, depending on the form of transportation. For example: as a function of *mass transported per energy consumed* products transported by maritime shipping typically entail less air pollution than products transported by trucking (OECD, 1995). Locally produced foods naturally decrease transports and its environmental impact. It is however important to take into account the food processing networks. If a food product is to be processed elsewhere than in the vicinity of its production site, and then transported back to the area of its original production, the environmental benefits of locally produced food may be lost in that process.

3.10. Exportation of environmental effects/impacts

As Sweden decrease its farmland, the area of farmland somewhere else most increase correspondingly or agriculture most be intensified correspondingly somewhere else to sustain our needs (Johansson, 2005). Both options entail increased environmental effects due to transports. Furthermore, both options also entail both local and global environmental effects not related to transports: agriculture in itself is environmentally problematic due its use of fertilizers, pesticides and herbicides, and its air and water emissions (Swedish board of agriculture, 2014). As the amount of domestic farmland available is decreasing and the population increasing, the exportation of the environmental effects of Sweden's food consumption is increasing, as illustrated by figure 5. This is in direct conflict with Sweden's generational goal as it states that the environmental effects/impacts should be decreased '*…without increasing environmental and health problems outside Sweden's borders*' (Proposition 2009/10:155). There is a relatively high awareness of farming-related environmental impacts within Sweden and the environmental impacts of farming have decreased significantly (Swedish board of agriculture, 2014). However, when relying heavily on imported food, the environmental impacts of producing food are 'exported' to its country of origin.



Figur 5. The greenhouse gas emissions from Swedish private consumption of food expressed in million tons of CO2 equivalents. The emissions include both the production and transportation of food (Swedish environmental protection agency, 2015).

If agriculture intensification is not an option (whether for technological or economic reasons) new land areas will be converted into farmland, and such conversions entail environmental effects specific to the land converted. One of these commonly occurring environmental issues today is deforestation, and especially conversion of tropical forests where expansion of agricultural areas represented 96% of deforestation in 2002 (Geist & Lambin, 2002; FAO, 2010). Beyond its values for biodiversity and cultural values, forest store immense amounts of carbon in biomass, soil, and dead wood and litter (FAO, 2010). Upon deforestation and conversion into farmland the carbon stock is to a large extent released as CO_2 (with or without delay as carbon stored in wood products), and the CO_2 that the forest provided will be lost. Between 2005 and 2010 an estimated 0,5 gigatonnes of carbon, out of a total of about 289 gigatonnes (2010), was lost on an annual basis from biomass alone (FAO, 2010).

Another aspect of exportation of environmental effects is water. In terms of global water footprint (how much freshwater that humanity consumes or pollute) agriculture represented 92% between 1996 and 2005. Furthermore, out of the total amount of freshwater consumed or polluted, export products represents roughly 1/5 of the total (Hoekstra and Mekonnen, 2012). Agriculture is commonly water intensive, and the water that results being contained within the finished product is known as *virtual water*. As an example: during the period 1995-1999 Sweden's balance of import and export of virtual water in crops (not all agricultural products) was close to equal (Hoekstra and Hung, 2005). As a function of this, Sweden imports vast amounts of water annually impacting its source or origin by depletion or pollution in relation to the given nation's/region's quantity and quality of water resources (van Oel et al., 2009). Even if the balance of virtual water flow is close to equal it does not entail a non-impact scenario as the conditions of nations and regions vary widely. As Swedish water resources are rich and continuously replenished a net virtual water export per se would not be problematic even though it entails environmental impacts, whilst a nation/region exposed to water scarcity could experience severe impacts of virtual water export (SOU 2007:60; Un-Water/FAO, 2007). Furthermore, virtual water commonly "flow" from water scarce regions to water rich regions and thus increasing land use efficiency in the latter, which is consistent with agricultural policy in Sweden (Kumar and Singh, 2005; Swedish environmental protection agency, 2009).

3.11. Planning

As pointed out by the Swedish board of agriculture (2013a) the planning horizons of CPs are not well suited to deal with farmland issues in the form that they appear today. Furthermore, the continuous expansion of urban areas onto quality farmland impedes the long term planning of farmers on the urban fringe, facilitating further expansion (Adelaja et al. 2011; Paül & Haslam McKenzie, 2013).

3.11.1. The municipal planning horizon versus the changing value of farmland

As pointed out by Swedish board of agriculture (2013a), there is form of mismatch between spatial planning decisions and the value or significance of farmland: spatial planning periods are commonly ~10 years whereas farmland needs to be valued over much longer time periods, rendering it vulnerable to short term decisions. Another way of expressing the latter could be: the point in time when farmland's true value could be asserted in the present lies beyond the scope of spatial planning decisions today. The present need of farmland (from a production perspective) is not great, and thus in a situation of weighting different land uses against each other, the need for an alternative land use may appear more valuable than farmland preservation as the value of the former can commonly be asserted in the present or within the horizon of municipal planning (Swedish board of agriculture, 2013a).

3.11.2. The farmers planning horizon

'The impermanence syndrome', coined by Berry (1978), describes the phenomena by which farming enterprises in urban vicinities stop investing in their business as function of development anticipation (leading to rising land values) and growing conflict with and/or difficulties caused by encroaching urban areas. Simplified this could be expressed as that the farmer's planning horizons are shortened and that the decline in investment is a function of the former (Adelaja et al. 2011; Paül & Haslam McKenzie, 2013). The rising land value, the value of any agricultural investments made when selling land intended for non-agricultural use, and the expected timespan before development projects are interested in the land contribute to a reluctance for continued farming (Adelaja et al. 2011; Paül & Haslam McKenzie, 2013). It's important to point out that for individual farmers, a development project may be desirable as a source of income, as noted by Paül & Haslam McKenzie (2013).

3.12. The criteria's for CP and EIA review

From the literature review a number of criteria's that are interest for valuation of farmland have been identified, for use in reviewing the chosen CPs and EIAs. This section should be viewed as a continuation of the literature review as some new information is presented. Several of these criteria's are intricately linked and could/should be discussed together or as a single issue. However, in order to clearly present the underlying issues all criteria's are here presented individually:

1. Discuss chapter 3, section 4 of the environmental code: In order for farmland to be preserved the municipalities should discuss what the section entails and the impacts that it has on physical planning decisions.

2. Definition of *agricultural land suitable for farming*: It is apparent that a definition of the term is essential considering the legal weight it carries. Forgoing to define this term at the level of comprehensive planning opens up to exploitation of all farmland as there will be no or very loose guidelines for the local plans to follow (Proposition 1985/86:3; SFS 1998:808; Swedish board of agriculture, 2013a).

3. Definition of *essential societal interest*: The need to define this term is paramount as it determines what kind of development projects that is more important/valuable than farmland. If the previous cannot be done, then a motivation of why a given alternative land use should be considered as an essential societal interest needs be given. Lacking both of these a land conversion fails to meet the requirements given by the environmental code (Proposition 1985/86:3; SFS 1998:808).

4. Discuss the generation goal: The generational goal is indicative of all environmental efforts and is essential to the interpretation of subordinate environmental quality objectives. Furthermore, along with globalization of environmental effects are growing evermore global in their character and an equally global approach is required to deal with these effects (Proposition 2009/10:155; SOU 2014:50).

5. Discuss the connection *to A varied agricultural landscape*: Being the environmental quality objective that express targets for agriculture in general and agricultural production specifically it is of great importance for the municipalities to discuss its meaning and how they adapt and comply to it (Proposition 2009/10:155).

6. Discuss connection to other environmental quality objectives: As agriculture and farmland are linked to several environmental targets, the municipalities should describe the impact that farmland conversion has on these environmental targets (Proposition 2009/10:155).

7. Perform any form of tradeoff: As illustrated by the Swedish board of agriculture (2013 a) there is a lack of actual weighting of interests in cases where farmland is part. A tradeoff is here defined as weighting both the positive and negative aspects of the alternatives.

8. Discuss the quality of soils in the area: In order to understand the value of farmland and/or the impact of converting farmland one has to know the quality of the soil in question. Municipalities should discuss the quality of soils and how they determine the quality (SOU 1971:75; SFS 1998:808; Swedish board of agriculture, 2013a).

9. Discuss the irreversibility of building on farmland: In order to understand the impact of building on farmland municipalities should discuss the fact that the process of converting farmland into urban areas, unlike overgrowth, is irreversible (EEA, 2006; Swedish board of agriculture, 2013a; Swedish board of agriculture, 2013b).

10. Discuss the role of agriculture in sustainability: As there are clear environmental objectives with regards to sustainability, and also clear statements of sustainable application of the environmental code, municipalities has to discuss what role agriculture (and as such also farmland) has in reaching a sustainable society (SFS 1998:808; Proposition 2009/10:155).

11. Consider a national perspective: The environmental code clearly states the national importance of agriculture and as such also farmland and thus municipalities cannot 'disconnect' its own farmland from that of the national when managing it in physical planning: the importance of the farmland, and the impact the loss of it has in national perspective should be highlighted (SFS 1998:808).

12. Discuss the value of Swedish farmland in a global context: In a global context, the preconditions for farming in Sweden are good, and with climate change they are expected to improve further whilst many agricultural areas globally are expected to experience adverse effects leading to a decrease in production. Municipalities should in such a context discuss the value and role of Swedish farmland (SOU 2007:60; SOU 2014:50).

13. Discuss the role of agriculture under climate change: With looming climate change there is a clear need to adapt planning thereafter, and as such municipalities should incorporate future scenarios into their physical planning involving agriculture and farmland (Parry et al., 2004; Beck, 2013; SOU 2014:50).

14. Discuss food security: With looming climate change our possibilities of importing food may very well be severely reduced, and as a result Sweden may have to rely on domestic food production to a larger extent than today. In order to understand the future value and need of farmland the municipalities should discuss future threats to food security (FAO, 2009; SOU 2014:50).

15. Describing the consequences of loss of farmland: In order for any weighting to take place the actual consequences of converting farmland must be presented. If the consequences are not described the compliance to the environmental code, the generational goal and the environmental quality objectives cannot be assessed (SFS 1998:808; Proposition 2009/10:155)

16. Discuss motive for exploitation: In order to assess the need and the legal grounds, as stated by the environmental code, for a land conversion the motive need to be clearly discussed (SFS 1998:808).

17. Discuss urban sprawl or densification: As many of the expansive cities and regions are located to areas of prime farmland the municipalities should discuss what they are doing in order to avoid urban sprawl, and as such how to avoid converting farmland (Swedish board of agriculture, 2013a).

18. To present actual figures related to farmland conversion: As found by the Swedish board of agriculture (2013a) the municipalities believe that farmland will continue to be

converted at relatively high rate. And in order to understand and get a perspective on the loss of farmland municipalities should present actual figures/numbers on their exploitation of farmland, thus supporting their physical planning decisions.

19. Discuss transports/freight of food: The municipalities should discuss the environmental impacts that both national and international freight of food has, and the connection between Swedish farmland and such environmental impacts (SOU 2005:51).

20. Discuss or state policy for prioritizing high quality farmland preservation: Chapter 3, section 4 of the environmental code states that farmland may only be built upon if a given essential societal interest cannot be satisfied by developing other land instead. However, in certain situations there might not be another form of land available, and if possible the lesser of the two should naturally be chosen for conversion (Proposition 1985/86:3; SFS 1998:808; Swedish board of agriculture 2013a).

21. Realize increased value of farmland due to a growing population: As the population, both nationally and globally, continue to increase, the demand for food will rise correspondingly and the municipalities should discuss what impact this development has on the value of farmland (SOU 2014:50; FAO, 2009).

22. Discuss the impact of biofuels on farmland: With uncertain fossil fuel resources biofuels are becoming ever more important, and with growing demand for biofuels and climate policies facilitating the former, the demand for farmland will rise. Municipalities should as such discuss the value of farmland as a resource for both food and energy, and the increasing demand and need for farmland as a function of biofuels production (SOU 2007:60 b; FAO, 2009).

23. Realizing farmers need of long planning horizons: As farmers are impacted by planning decisions long before their land is actually claimed, the municipalities should recognize and discuss farmer's need of long planning horizons and that their planning decision may inadvertently shorten planning horizons for farmers (Adelaja et al. 2011; Paül & Haslam McKenzie, 2013).

4. Review of CPs, EIAs and CAB review statements

The review of the CPs and EIAs naturally includes an element of subjectivity as the writings and formulation are all interpreted by the author.

4.1. Review of the CPs and EIAs

The review shows that there is a large variation in criteria's fulfilled amongst the municipalities: most criteria's are only fulfilled by a few CPs and EIAs, whereas criteria's with high rate of fulfillment are few. Only the densification-criterion is fulfilled by all CPs and EIAs. 5 of the 23 criteria's were fulfilled by none: 1) definition of *agricultural land suitable for farming*; 2) discuss

the generational goal; 3) discuss the connection to other environmental targets; 4) describing the consequences of losing farmland; 5) discuss the link between loss of farmland and transportation/freight (figure 6). In terms of criteria fulfillment the municipalities of Halmstad and Lund are clearly prominent in relation to the others; on several occasions being the only two to fulfill a criterion.

Only Linköping discussed the meaning of chapter 3, section 4 of the environmental code, and what it entails. In the process of doing so, Linköping also provided a form of loose definition of what an essential societal interest is:

> *The public interests that can be invoked as support for a claim can be e.g. the need of land for residences, businesses and recreation, to create well-functioning and suitable technical supply systems as well as the ambition to create an effective and long term sustainable settlement, communications and green structure* (Linköping municipality, 2010a, p. 41).

Of the remaining municipalities, most mention chapter 3, section 4 of the environmental code but does not discuss its meaning or impact. Correspondingly they do not either define or attempt to define what an essential societal interest could be. *Agricultural land suitable for farming* was not defined by any municipality. Halmstad municipality however discussed the shortcoming of the cropland classification as a tool for determining the quality of farmland. The generational goal was mentioned but no municipality discussed any relation to farmland or farming whatsoever. The municipalities of Uppsala, Västerås and Halmstad discussed a connection between farmland in physical planning and the environmental quality objective *A varied agricultural landscape* in their plans, but none of the municipalities discussed a connection between farmland in physical planning and other environmental quality objectives. However, the described connection to *A varied agricultural landscape* are somewhat equivocal. For example: in the EIA for Uppsala it is stated that the plan has an overall positive impact on the objective achievement; but in the motivation for this statement it is clarified that the plan both protected one area of farmland and exploited other areas (Uppsala municipality, 2010b).

None of the municipalities perform any form of tradeoff, though it shall be stated that they commonly refer to a tradeoff being done in situations of designating farmland for development:

> *It is done in a tradeoff along with several other interests, e.g. proximity to public transport and the possibility to strengthen existing localities* (Halmstad municipality, 2014, p. 42).

All municipalities except Halmstad discussed the quality soils in the area. Halmstad, as previously mentioned, stated that the cropland classification was lacking in aspects for determining the quality of soils. The municipality did however state that the farmland was valuable. The municipalities of Västerås, Halmstad and Lund clarified that development projects on farmland are irreversible:

> *To build on farmland and forestland entails that the land permanently is put out of production, which is not good economizing of land* (Västerås municipality, 2010a, p. 73).

> *Exploitation of farmland is irreversible and increasingly we need to view farmland as the finite resource that it is* (Halmstad municipality, 2014, p. 224)

All municipalities except Linköping discussed the role of agriculture and farmland in relation to sustainability. The national perspective of farmland conversion was discussed by the municipalities of Uppsala, Halmstad, Lund and Linköping, whereas only Uppsala and Halmstad municipality discussed the value of Swedish farmland in global context:

> *The agricultural land suitable for farming in the municipality is important to protect, not least in the perspective of climate change. Agriculture can contribute to the global food security and to a reasonable share of local food security* (Uppsala municipality, 2010a, p 28).

The role of agriculture under climate change was discussed by the municipalities of Uppsala, Halmstad and Lund:

> *For southern Sweden future climate change may provide longer growth seasons with larger or more crops* (Lund municipality, 2010a, p. 21)

Only the municipalities of Halmstad and Lund discussed national food security issues:

With increasing population and a decrease in the area of arable land globally the importance of Swedish farmland for food production will increase in years to come (Halmstad municipality, 2014, p. 41).

A clear motive for urban development on farmland was provided by the municipalities of Uppsala, Halmstad and Linköping. Densification was discussed multiple times by all municipalities in both there CP and EIA. Only Halmstad and Lund municipality provided figures on farmland topics, with Lund presenting full tables with multiple variables. The municipalities of Halmstad, Lund and Linköping stated policies for safeguarding high quality farmland in preference for lesser quality farmland when there were no other alternatives to developing on farmland. Again only Halmstad and Lund municipalities discussed an increasing value and/or pressure on farmland due to the increasing need and use of biofuels.

> *Global warming demands a phasing out of fossil fuels, which in turn will place demands on land for cultivation of crops that can be transformed into biofuels. This will lead to increased competition over the arable land, which places even higher requirements on management of land* (Lund municipality, 2010a, p. 16).

The farmers need for long term planning was discussed only by Halmstad municipality, with a rather clear statement on the issue that encompasses the underlying problem:

> *For farming and forestry alike it's important with cohesive structures for rational operations and clear information about future land use in order to venture to develop and invest* (Halmstad municipality, 2014, p. 41).

Criteria	Uppsala		Västerås		Malmö		Halmstad		Lund		Linköping		Rate of fulfillment
	CP	EIA	CP	EIA	CP	EIA	CP	EIA	CP	EIA	CP	EIA	
Discuss environmental code 3:4	0	0	0	0	0	0	0	0	0	0	1	0	1
Agricultural land suitable for farming	0	0	0	0	0	0	0	0	0	0	0	0	0
Essential societal interest	0	0	0	0	0	0	0	0	0	0	1	0	1
Generational goal	0	0	0	0	0	0	0	0	0	0	0	0	0
Connection to *A varied agricultural landscape*	0	1	0	1	0	0	0	1	0	0	0	0	3
Connection to other environmental targets	0	0	0	0	0	0	0	0	0	0	0	0	0
Perform tradeoff	0	0	0	0	0	0	0	0	0	0	0	0	0
Discuss quality of soils	1	1	1	1	0	0	0	0	1	1	1	1	8
Irreversability	0	0	1	0	0	0	0	1	1	0	0	0	3
Discuss agri role in sustainability	1	0	1	0	1	0	1	1	1	0	0	0	6
Consider a national perspective	1	0	0	0	0	0	0	1	1	1	1	0	5
Swedish farmland in a international context	1	0	0	0	0	0	1	0	0	0	0	0	2
Discuss role of agriculture under climate change	1	0	0	0	0	0	1	1	1	0	0	0	4
Food security	0	0	0	0	0	0	1	0	1	0	0	0	2
Are the consequences of loss described	0	0	0	0	0	0	0	0	0	0	0	0	0
Discuss motive for exploitation	1	0	0	0	0	0	1	1	0	0	1	1	5
Densifying	1	1	1	1	1	1	1	1	1	1	1	1	12
Figures on farmland related issues	0	0	0	0	0	0	0	1	0	1	0	0	2
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
Policy for prioritizing	0	0	0	0	0	0	1	0	1	1	1	0	4
Increased value due to population increase	0	0	0	0	0	0	1	1	1	0	0	0	3
Increased need for land due to biofuel	1	0	0	0	0	0	0	1	1	0	0	0	3
Farmers need for long term planning	0	0	0	0	0	0	1	0	0	0	0	0	1
Number of criteria's fullfilled	8	3	4	3	2	1	9	10	10	5	7	3	
The sum of criterias fullfilled	11		7		3		19		15		10		

Figure 6. Results of the CP and EIA review

4.2. Review of the CAB review statements

5 of 6 municipalities received remarks on their handling of farmland, and 1 municipality received remarks on both the CP and the EIA (note that all remarks could not be directly attributed to either the CP or EIA, in which case I ascribed the remark to the CP). The link between municipal criteria fulfillment and CAB remarks suggests that there are large variations amongst the CABs with regards to their view on farmland preservation: Västerås, with the second lowest number of criteria's fulfilled received no CAB remark whereas Halmstad, with the most criteria's fulfilled, did receive CAB remarks.

Skåne CAB remarked on the EIA of Lund, stating that the ratio between population growth and per area population raised the question whether the density of development areas were sufficient (Lund municipality, 2010b). Furthermore, under the required focus area of regional coordination in issues of land and water utilization, Skåne CAB again remarked on the ratio between population growth and population density on the CP of Malmö. The argument for this remark was that the infrastructure and public transport system in the county of Skåne made it easy to live and work and study at different location and that the housing demand can and should be approach as a regional issue, thus limiting urban sprawl (Malmö municipality, 2010). In addition to previous remark for Malmö Skåne CAB stated that it believed that the plan would entail significant environmental impacts with regards to the management of land and water as well as new infrastructure, and that the EIA insufficiently described these consequences. The CAB consider that there are specific cases where the EIA's level of detail does not correspond to concrete suggestions given by the CP (Malmö municipality, 2010). Furthermore, the CAB stated that it does not consider surface- accommodation in general (such as a single family house) to constitute an essential societal interest (Malmö municipality, 2010).

With regards to Uppsala's CP, Uppsala CAB stated that agricultural land suitable for farming, both within and outside expansion areas, as far as possible should be preserved. Furthermore, the CAB suggested that whenever cropland is developed, consideration should be given to the structure of remaining cropland so that it may be farmed in a rational manner (Uppsala municipality, 2010a).

Östergötland CAB stated that even though Linköping focuses on densification it's important to consider the fringe land agriculture and its production capabilities and meaning for agricultural enterprises (Linköping municipality, 2010a).

Halland CAB made a remark, stating that if Halmstad municipality will plan to expand outside designated urban limits, clear motives most be presented as to why farmland should be converted (Halmstad municipality, 2014).

5. Interview study

The interview questions are based on the findings in literature review as well as the result of the review of the CPs, EIAs and CAB review statements. The question designs are located in appendix 1.

During the interviews there were a substantial number of additional comments referring to certain answers being *a personal opinion* or that the respondent's professional role was not suitable for answering a specific question. I however included all statements relevant to the issue regardless of such additional comments, as the main purpose of the interviews was to understand the problems, underlying beliefs etc. As such the result of the interview section should be approached as a mixture of official policies and standards and personal ideas and beliefs of people working/has worked with the CP, EIA and within the CAB.
In total there are 15 respondents: 6 CP respondents, 5 EIA respondents and 5 CAB respondents. 1 municipal respondent answered both the CP and the EIA questions, 1 municipality could not provide or recommend a suitable respondent for the EIA section, and 2 of the municipalities are located in the same county and as such corresponding to the same CAB. There were 1 case of stated unwillingness to answer, and a few cases were the respondent declined to answer due to stated incapacity to answer.

5.1. Interview results

The interviews revealed 5 main topics perceived to be the most difficult factors in valuing farmland:

1. A lack of knowledge/expertise in the area
2. The time - room mismatch
3. That the scale for determining the value of farmland (the cropland classification) is too simplistic and/or does not provide the whole truth/situation.
4. That one is required to perform weighting between fundamentally different aspects
5. That the term essential societal interest is too vague

As for the meaning of the term *essential societal interest* the most common reply to was that the term is context and location-specific, and as such very hard to define at the level of comprehensive planning. However, a commonly recurring answer from CP and EIA respondents was that urban areas most be allowed to grow, and that in itself would constitute an essential societal interest. Housing constructions in general and associated infrastructure were commonly perceived to be essential societal interests. Any clear delimitation of the term was only provided by 1 respondent.

> *Essential societal interest is that a municipality or city shall have the possibility to continue growing and developing. And it's a fuzzy term that one can interpret in any way you want* (Respondent F, Halmstad municipality).

> *...we have said that construction of single housing or smaller groups of detached houses on suitable farmland shall not constitute an essential societal interest* (Respondent C, Västerås municipality)

The CAB respondents were slightly more restrictive in their answers as to what could constitute essential societal interests. The only concrete examples of what constitutes an essential societal

interest were the research facilities ESS and MAX IV in Skåne county. Furthermore, there were large variations in approach to, and awareness of the issue amongst the CAB respondents:

> *That's a really hard question. In regards to what we do in the review statement, we very seldom bring up farmland; we keep to the grounds for revision* (Respondent M, Östergötland CAB).

> *That is determined from case to case, it's not really possible to say. It shouldn't be able to be placed anywhere else so to say. Hence it becomes a discussion that has to be taken from case to case* (Respondent L, Västmanland CAB)

As for the term *agricultural land suitable for farming* a majority of the 15 respondents stated that there was a relation to the cropland classification. However, only two stated that there was a specific class or rough estimation of class above which agricultural land would be viewed as suitable. However, there were recurring comments about the cropland classification being too simplistic and that there were important aspects not included in the classification. There were also several conflicting statements about present farming activities as a major factor for determining the suitability of farmland: some reasoned that if the land is presently being farmed it would be considered as suitable, whilst others stated that there clearly is suitable farmland not presently being farmed. It was made clear during the interviews that there is a general want and need for more knowledge and expertise with regards to this term. Several statements were made about attempts to reach out for help in the matter but there was little external input to be had.

> *Agricultural land suitable for farming is primarily about the land that is in production today, but it's a rather fuzzy term as there is a lot of valuable farmland not in production* (Respondent A, Uppsala municipality).

> *Now that is extremely difficult, and we have been trying to get help on this from every which way. If you look at the classification from the 70's, then that's not the whole truth because there are other parameters that would make a land area suitable for farming* (Respondent F, Halmstad municipality).

The CP and CAB respondents were given a question regarding at *what level of the planning process should the main tradeoffs with regards to farmland be made*, and there was consensus that it was at the level of comprehensive planning. During the interviews, the level of detail was a commonly recurring theme. Considering that comprehensive plans are just that, comprehensive, the level of detail cannot be that great. And the EIA, being a product of the CP, commonly should have the same level of detail.

> *…it's always a question of what level of detail that one is talking about. Because it's a challenge to do an EIA on the CP-level, when it's about overarching structures that you're planning for. And should you then report in detail in the EIA? Somehow you need to find the same level that one has in the CP* (Respondent G, Halmstad municipality).

With regards to chapter 6, section 12 of the environmental code specifically, there was a general consensus of that the requirements of section 12 should be met in an EIA at the level of

comprehensive planning. There were however a few conflicting statements of the requirements not being fulfilled by the current EIAs:

> *On the level of comprehensive planning, not really! How far should you go with a comprehensive plan!?* (Respondent E, Malmö municipality)

It was also made clear during the interviews that the EIA cannot be read as a standalone document, but rather be read in conjunction with the actual plan that it represents, in order for the requirements of section 12 to be fulfilled. Several respondents also stated that the type of large scale structures dealt with in a CP, and the overarching form of these issues, makes it difficult to find a suitable level of detail to describe environmental impacts.

With regards to chapter 3 of the environmental code, all CP respondents believe that their corresponding plan consider a national perspective on farmland. However, paradoxically enough, 3 of the CP respondents and 2 of the CAB respondents does not believe that municipalities have the capability to value 'their' farmland in a national perspective. Of the remaining CP and CAB respondents another 2 believe that they can value 'their' farmland in a national perspective, and the remaining were uncertain. Furthermore there were statements of large regional and/or municipal variations in the capability to do so. The varying view and awareness of the CAB respondents on the matter of the possibility of municipalities to value 'their' farmland in a national perspective are well illustrated by these quotes:

> *I can't really answer that! I think we've accepted what they have said (the municipality in the comprehensive plan). But we have been getting more interested in the issue, and the question is if whether it can be that way in the future* (Respondent N, Halland CAB).

> *I don't think so really! That's what's shown in the report by the Swedish board of agriculture: that it is a question in a global context and a very long term perspective, while the land conversion decisions that are being made are in a very local context and in a relatively short term perspective, such as that of a comprehensive plan or even shorter perhaps. Then it becomes very difficult to put a price on a land conversion, other than that of what you plan to do on site. It's very hard to assess the future value of what you already have* (Respondent O, Skåne CAB).

All CP respondents believe that land areas (as managed in the CP) are used for the purpose that they are most suitable for, thus conforming to chapter 3, section 1 of the environmental code (SFS 1998:808). 5 of 6 CP respondents state that investigations of the possibilities of developing other land were performed prior to developing on farmland, the remaining 1 being uncertain. With regards to the application of the environmental code in accordance with its opening section, chapter 1, section 1 the CP respondents answered vaguely. Out of 3 positive replies only 1 was clearly affirmative. A further 2 were too vague to categorize, and the remaining one stating that it is a matter of interpretation. 13 out of the total 15 respondents believe that there is link between farmland in physical planning and the environmental target *A Varied Agricultural Landscape*, the remaining 2 being uncertain. Yet again 13 out of the total 15 respondents believe that there is link between farmland in physical planning and some other environmental target/targets, the

remaining 2 being uncertain and unwilling to answer respectively. It is noteworthy that the non-positive respondents are not the same in both questions.

> *Zero eutrophication, reduced climate impact, a balanced marine environment, flourishing coastal areas and archipelagos: almost everything! But it's also dependent on how the farmland is used. The agricultural sector is very much related to the environmental quality objectives* (Respondent A, Uppsala municipality).

> *Yes it could, several of them. It's negative impact!* (Respondent D, Västerås municipality).

Furthermore there were statements about the achievement of certain environmental targets may be higher if farmland were indeed converted into urban areas.
In some cases the target achievement might be higher with some other usage than agriculture (Respondent E, Malmö municipality)
Linked to the previous is the matter of exportation of environmental impacts. 8 of 10 EIA and CAB respondents believe that farmland conversion in Sweden leads to environmental impacts in foreign countries. However, at the same time it appears to be a question most EIA respondents feel is hard to handle within the framework of a comprehensive plan.

> *Absolutely! I don't know how to describe though. Naturally, if we do something else with our farmland then we would probably need to produce that food elsewhere. Very interesting, but I don't know how one should handle that, except mentioning it. It would be good if the matter could be highlighted* (Respondent B, Uppsala municipality).

> *Well if we don't produce it here then it will have to be produced somewhere else, and vice versa. It affects, with a global economy everything is connected* (Respondent L, Västmanland CAB).

> *Yes it defiantly could! If we have 0,2 hectares but actually need 0,4 hectares to sustain us, then we are missing 0,2 hectares. So naturally that will cause environmental problems in other countries, it's rather obvious!* (Respondent O, Skåne CAB).

Furthermore, several CP respondents felt that exportation of environmental impacts linked to food imports are a part of ethical aspects related to farmland conversion. However, and interestingly enough, the generational goal was not mentioned a single time during the interviews. The opposite of exportation of environmental effects would be locally produced food and all CP respondents believe that it is important to promote locally produced food, but only 2 of 5 EIA respondents clearly state that farmland conversion could lead to increased transportation of food.

> *Yes, if we don't have land of our own we have to buy from somewhere else* (Respondent J, Linköping municipality).

Both yes and no! If we would get better at only consuming local produce, then there would be longer transports if we couldn't utilize locally produced crops (Respondent G, Halmstad municipality)

3 of 6 clearly state that there is a need to protect farming as a business sector in order to preserve farmland, with the other answers being: *no* and *uncertain* and one that declined to answer.

...perhaps one takes it for granted, that as long as there are land there will be actors (famers) (Respondent H, Lund municipality).

Furthermore there were, from both positive and non-positive respondents, statements of uncertainty as to what could be done on the level of comprehensive planning to facilitate this, and also whether this was a role that they should or could take. Furthermore, 4 of 10 CP and EIA respondents believe that farmers are in need of long planning horizons, whilst the remaining respondents stated uncertainty or that the planning horizon-needs of farmers are comparable to other business sectors. 14 out of the total 15 interviewees believe that there is some form of long term threat to national food security, with the remaining 1 being uncertain. However, there were also statements about this issue not being included in the plans.

Yes, absolutely! We must safeguard the land that we have. We have reasonably good conditions so far, but with climate change and areas around the world that might not be fit for agriculture in the future, and an increasing population in northern Europe it can be a threat; which makes it even more important to safeguard the farmland that we have (Respondent G, Halmstad municipality).

It's not in the plan but the idea exists (Respondent I, Linköping municipality).

Potential threats discussed were: farmland conversion, climate change, changing global conditions for farming, more difficult and/or more expensive to import food, energy limitations and decline in fossil fuel availability, increased demand for energy crops, lack of chemical fertilizer, increased population, consumer behaviour and the general and economic conditions for farmers.

Yes, if one consider a changing world where we no longer have access to fossil fuel to the extent that we have today, and maybe not access to phosphorus as a fertilizer either, which also is a finite resource that moreover needs to be extracted, it is clear that the type of farming we have today that can sustain large populations on small land areas…we may not have that possibility in the future, or lessened possibility to do so. And on top of that maybe more expensive and longer transports, harder to import our food. So naturally, if we today have access to half of our cropland and that we also might need to fertilize our lands with something other than chemical fertilizer, we can't develop all land (Respondent O, Skåne CAB).

As for the role of the CABs: 3 of 5 CABs clearly state that they use their review statement to highlight and emphasize the value of farmland; whilst the other 2 state they instead primarily use their consultation statement for this purpose. It is also pointed out that farmland is not included in their grounds for revision, meaning that any such statement will be added as additional comments

and also carries less weight. Furthermore, none of the interviewed CAB's knew of any application of chapter 6 section 21 of the environmental code.

> *We divide our statements into two sections, one being our grounds for revision, where we are able to stop local plans. And farmland does not fit into that one but the next: additional comments. And this is about legislation* (Respondent K, Uppsala CAB).

6. Analysis and discussion

This chapter will form the synthesis of the literature review, the review of the CPs, EIAs and CAB review statements, and the interview study.

The CP, EIA and CAB review statement reviews did not reveal any definition of the term *agricultural land suitable for farming*. The interviews did however show (to a varying degree) that the cropland classification and whether the land is presently farmed or not, are decisive factors in determining if a given area of agricultural land would indeed be suitable for farming as given by the environmental code (SFS 1998:808). That an area of agricultural land could be assessed as 'not suitable for farming' due to it not being presently farmed cannot be supported by the environmental code (SFS 1998:808) or its groundwork. (Proposition 1985/86:3; Proposition 1997/98:45; Enghag, 2015). The term is specified as 'land that with regards to location, characteristics and other preconditions are suitable for agricultural production' (Proposition 1985/86:3, p. 158), which potentially could be somewhat difficult to determine, but it does not in any form relate to economic conditions. With regards to using the cropland classification for determining whether an area is suitable for farming is also somewhat problematic. The aim of the cropland classification was to express the economic value of cropland as it was in 1971, and not the potential of cropland (as the production potential of cropland neither de facto determines the economic value of cropland nor is the production potential static): its suitability for agriculture (SOU 2007:60; Swedish board of agriculture, 2007; Beck, 2013). Furthermore, the sample data series for the classification is very small or even just a one year sample, and as such rather unreliable from a statistical standpoint. No consideration was paid to crops not included in the crop-damage protection program, thus the situation could potentially be different today, not least considering introduction of new crops and varieties (Kungliga Lantbruksstyrelsen, 1971; Swedish board of agriculture, 2007; Swedish environmental protection agency, 2009). The cropland classification also includes an adjustment of the yield value (used for the classification) based on additional costs incurred by producing potatoes and sugar beets. In addition the calculation includes another adjustment: the yield value is adjusted according to region due to additional cost incurred by a farm not located in northern Sweden (Kungliga Lantbruksstyrelsen, 1971). The present relevance of such adjustments would need to be investigated. Furthermore, the cropland classification is based on statistical data sometimes supported by empirical assessment. If the statistical calculation has been amended by empirical assessments, these assessments are based on condition in 1971, suggesting that the present situation could be another considering that both internal and external factors would have changed in the time period since. The cropland classification is thus to no small extent based on economic conditions circa 1968-1971 (Kungliga Lantbruksstyrelsen, 1971). Considering the previous and that the term *agricultural land suitable*

for farming has no relation to economic conditions (whether it be in the past, present or future) the cropland classification is of limited use for determining the 'suitability' (Proposition 1985/86:3; Proposition 1997/98:45). In fact, as the term *agricultural land suitable for farming* has no relation to economic conditions all areas included in the cropland classification could in a general sense be said to be suitable. As such, there is a major inconsistency with this type of use of the cropland classification: firstly, the cropland classification and the term *agricultural land suitable for farming* refer to two different aspects; secondly the cropland classification was designed in 1971 as a tool for facilitating planning decisions relating to farmland, whereas the term *agricultural land suitable for farming* originates from *naturresurslagen* (SFS 1987:12) (law on natural resources), introduced in 1987. As such the cropland classification could pre-1987 be used to determine if an area of agricultural land was 'suitable' (the term did not exist), but post-1987 naturresurslagen supersedes any such determination as the focus had moved from the economic value of production to the preconditions for production. The interviews (and 1 statement in CP for Halmstad) did however show that there is awareness about the shortcomings of the cropland classification as a tool for determining or defining *agricultural land suitable for farming*, but lacking another tool or method it would appear that the cropland classification still hold significant influence in the matter.

This study shows that the comprehensive level of planning is where decisive considerations and tradeoffs with regards to farmland should and need to be made, but at the same time the definition of the key terms *essential societal interest* and *agricultural land suitable for farming* are largely overlooked by the municipalities at this level of planning. That what could constitute an essential societal interest is context and location-specific, as suggested by the interviews, is natural as any two places in differing situations would not have the same societal needs and the same abilities to fulfill them. However, the fact that places and situations vary would entail that the term cannot be defined appears somewhat simplistic. If X number of potential societal interest were to be identified, the question rather becomes if a given 'candidate' would constitute an essential societal interest in a given location and context, thus giving clearer directives to local plans and programs. This matter is illustrated well by Skåne's CAB review statement on Malmö's CP, where the CAB states that it does not consider surface- accommodation in general (such as a single family house) to constitute an essential societal interest (Malmö municipality, 2014). However, it must be stated that any definition of the term does not necessarily imply an improved situation as illustrated by the definition given by Linköping municipality quoted previously: the definition encompasses more or less the entire scope of human activity. Furthermore, with regards to the remark by Skåne's CAB about housing demand being more of a regional than municipal interest to fulfill: there is possibly an aspect of municipal self interest in this matter as there is an economic value of population growth, making such a regional approach complex.

The global perspective, whether it be as given by the generational goal or the global food system that Sweden is a part of, is largely lacking in the planning. Two different aspect of the issue can however be distinguished: 1) the exportation of environmental effects: 2) the impact that future global scenarios might have on food security (nationally and globally), where the latter appear to receive more attention. The fact that the clear international approach was added to the generational goal as late as 2010 could be a factor in this matter: 3 of 6 plans studied was adopted in 2010 (Uppsala, Lund and Linköping (the 3 others are more recent)) and the new generational goal would have been hard to adjust to if at all possible. However, in the remaining plans there is

only 1 mention (that does not include any discussion) of the generational goal. The matter of exportation of environmental effects is more or less invisible in the CPs, EIAs and CAB review statement, whilst it was largely recognized as an issue in the interview study 1-5 years later, suggesting increasing awareness. However, paradoxically, even though exportation of environmental effects/impact being largely recognized as an issue, the generational goal was not mentioned once by CP, EIA or CAB respondents during the interviews. This suggests little awareness of the generational goal which could provide the missing tool, as discussed by EIA respondents, for incorporating an international aspect.

The connection between farmland in physical planning and environmental quality objectives was only to a small extent discussed in the CPs and EIAs, but again the interviews gave another perspective. All respondents believed that farmland in physical planning are connected to some of the environmental quality objectives. An incorporation of these views into CPs and EIAs would be highly desirable as it would not only add value to issue of agricultural production but also clarify the environmental impacts inherent to farming that should not be exported to other nations in accordance with the superior generational goal.

Densification as a means of curbing urban sprawl appears to be well established in all municipalities, to the point of being a prerequisite for any development project: the municipalities all focus on ‘inwards growth’, and by having such a policy development projects can be justified since it is then implicitly understood or suggested that it could be an essential interest to physically expand. The latter however in practice remains unclear if figures on related issues is lacking. To present figures related to farmland conversion issues was done by only 2 municipalities: Lund and Halmstad. In the case of Lund, the addition of figures appears to have enabled the CAB to remark on the population growth/population density ratio. The utilization of figures and statistics can clarify such matters by giving another perspective or dimension to the issue: when an urban area is subject to a population increase it can either physically expand or become denser, and to see the ratio between the two could clarify the patterns and help determine whether a physical expansion is actually a societal interest or a mere desire, as illustrated by figure 7.

None of the municipalities discussed a linkage between farmland conversion and transports/freight of food, and there were no related CAB remarks. However, paradoxically enough all CP respondents in the interview study believed that it is important to promote locally produced food.

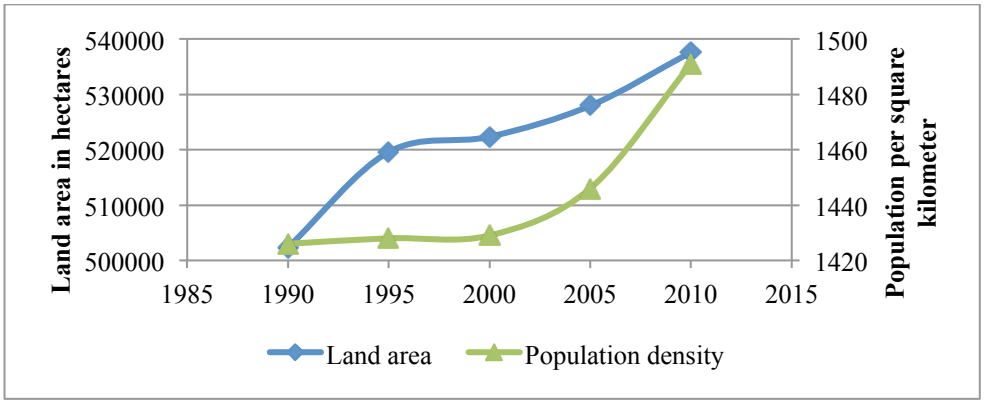


Figure 7. The changes in land area and population density of urban areas (tätorter) in Sweden (Statitics Sweden, 2015**c)**

The interviews reveled many beliefs that were not expressed in the CP and EIA. The primary reason for this appears to be the level of detail: there were recurring statements about that the CP are on an overarching level of planning and that this poses a problem for discussing/describing environmental impacts/effects in detail. To a certain extent this must naturally be said to be accurate as a CP simply cannot describe the exact environmental effects of a subsequent more detailed plan or program. However, the environmental impact/effect associated with farmland conversion can be described at a level of detail suitable for comprehensive planning. As an example: an area of farmland has been suggested as a future area of development, and naturally the CP cannot describe the detailed impact of the development, but it can describe what the general effects of developing this area would entail.

The link between the municipal criteria fulfillment of this study and CAB remarks suggests that there are large variations amongst the CABs with regards to their view and awareness of farmland conversion issues: as previously mentioned Västerås with the second lowest number of criteria's fulfilled received no CAB remark whereas Halmstad, with the most criteria's fulfilled, did receive CAB remarks. As farmland conversion issues cannot be challenged by the CAB, and especially not at the comprehensive level of planning; in situations where it considers the municipal management of farmland to be faulty, chapter 6, section 21 of the environmental code (SFS 1998:808) could potentially be a means of taking the issue further. This has however not previously been done by any of the CABs, and any such highlighting of the issue is naturally dependent CAB expertise, but the possibility should be explored. As there appear large differences in view and awareness, coordination between CABs would likely improve overall topic expertise.

Consistent with the findings of the Swedish board of agriculture (2013a) the interviews showed that municipalities commonly experience difficulties in weighing the value of farmland against a development project due to the different nature of the two. This matter really strikes at the core of the issue: farmland needs to be valued in long time perspective and in a both national and global context whilst development projects can and is valued in the present and in a local context, and in situations of balancing the 2 interests against each other these differences appear to render the value of farmland intangible (or perceived as intangible) whereas the value of a development project is tangible (or perceived as tangible).

With regards to the method, there are few issues of interest in need of discussing. Due to the time constraint of this study the interviews was designed to encompass only 2 respondents from each chosen municipality and thus providing a limited view of the topic within the municipality in its entirety. Furthermore, the use of criteria's for the review of the CPs and EIAs entails that aspects of farmland conversion not included in the criteria's have been overlooked. The search word approach of the review of the CPs and EIAs entails that certain statements that could be of some relevance to farmland may have been overlooked. However, considering the specific nature of the topic and that the search word approach was used to find entire sections of interest and not just isolated statements, any statements not found by the chosen approach will likely be of little relevance to issues of farmland conversion.

7. Conclusions

Even though significant differences between municipalities and respondents can be discerned the overall application of the environmental code and adherence to the environmental policy is inadequate for farmland protection to function within the framework of comprehensive planning. With regards to determining the preconditions for agricultural production and thus the 'suitability' of farmland the cropland classification can be helpful to an extent, but as pointed out even prior to the adoption of naturresurslagen (SFS 1987:12): in situations of conflicting land use interests the municipalities should perform more detailed investigations (SOU 1971:75). And considering the future uncertainty of global food production capabilities and population growth, all suggested development projects on farmland today would certainly entail conflicting land use interests, not least as given by the national importance ascribed to farmland by the environmental code (SFS 1998:808). Furthermore, to facilitate in determining or defining *agricultural land suitable for farming* there are ample data readily available for municipalities, such as: soil type and texture, climate statistics and projections, per area yields statistics etc.

With regards to essential societal interests, the scope of what it entails must somehow be narrowed. It is simply not enough to state overarching societal needs as essential societal interests; thus circumnavigating the purpose of the environmental code and national environmental policy. As stated in some form by all municipalities, housing is viewed as an essential societal interest, but can housing in general without any further delimitations be said to be an essential societal interest? If not defined, and overarching societal needs not delimited, what would be the purpose of a term such as essential societal interests as all societal needs could be viewed as essential interests. To state that the development of e.g. single family homes on farmland is an essential societal interest when there is a risk that Sweden within a not too distant future could potentially struggle to feed its population and most certainly not contribute to food security around the world, is alarming and reveals a far too localized and short term approach to farmland conversion.

The international/global perspective could indeed be fundamental to safeguarding farmland within Sweden as it could potentially provide the tool that could make the value of farmland tangible. That Sweden has to decrease its environmental impact is common knowledge at this time, the municipalities all focus on sustainability and there is a relatively high degree of

awareness of exportation of environmental impacts amongst most respondents, but the recognition that Swedish environmental progress may not happen at the expense of other nations could place a present value on farmland that it has not previously had. Therefore the generational goal should be highlighted and not least pushed forward by the CABs.

It is abundantly clear that Sweden utilizes more farmland than what is in production nationally, and even with the return to agricultural production of all the overgrown or forest planted areas Sweden would not be able to sustain itself. And in the light of multiple future uncertainties, and that expansive regions are located on high quality farmland that contributes to disproportionately large percentage of national food production, municipalities must take upon themselves to not exacerbate this precarious situation further. However, the national perspective is largely lacking in the CPs and the results of the interviews are highly conflicting with statements of both adherence to the national importance and inability of valuing farmland in a national perspective. If the municipalities however, were to use the tools and knowledge available the ascribed protection of farmland, given by the environmental code, has good potential to safeguard some of the most valuable farmland in Sweden. However, even if municipalities were to shoulder a greater responsibility for farmland protection, perhaps even fulfilling all the criteria's identified in this study, some form of national coordination would be necessary to accommodate the national importance of farming. Even with the most rigorous municipal compliance with chapter 3, section 4 specifically and the environmental code in general and the national environmental policy, urban areas will at some point be forced to physically expand as a function of population growth. Therefore it must be said to be self-evident that the task of safeguarding food production capabilities on a national level cannot be expected to be performed by Sweden's almost 300 individually operating municipalities without a higher level of authority coordinating and overseeing the efforts. Even though it theoretically could be possible for municipalities to handle the issue of farmland preservation on a local scale, I must in the light of this study underscore the findings of the Swedish board of agriculture (2013a) and the All party committee on environmental objectives (SOU 2014:50) that there is need for stronger regional and national planning, and that amendments to present legislation, giving farmland a stronger protection, would be desirable.

8. Concluding remarks

Following this study it can safely be said that there is a clear and present need for more research in this field. *How can municipal awareness and compliance to the national environmental policy be strengthened* would be a key topic.

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10. Appendix 1

Here follows the interview questions used in this study. There are 3 sets of questions corresponding to CP, EIA and CAB respondents.

10.1. Interview questions for CP respondents

Questions directly towards the environmental code

1. Do you consider that the municipality has applied the environmental code in accordance with its opening section chapter 1, section1 in the assessments relating to farmland?
1. What do you consider to constitute an essential societal interest?
2. What do you consider to constitute agricultural land suitable for farming?
3. Do you consider that the management of farmland in the plan is in accordance with the national importance expressed by the environmental code?
4. Do you consider that the plan is in accordance with chapter 3, section 1 of the environmental code?
5. When farmland was designated for development, was an inquiry as to the possibilities of alternative locations performed?

Environmental policy

1. To you consider farmland in physical planning to be linked to the environmental quality objective 'A varied agricultural landscape'?
2. Do you consider farmland in physical planning to be linked to any other environmental quality objective?

General questions

1. At what level of municipal planning to you think that the main tradeoffs with regards to farmland should be made?
2. Do you see any long term threats to food security in Sweden?
3. Do you see any ethical aspect in preserving farmland?
4. Do you believe that the municipality is capable of valuing its farmland in a national perspective?
5. Do you think it's important to promote locally produced food?
6. Do you think that farmers are in need of long planning horizons?

Concluding question

1. What, if anything, do you perceive as difficult with regards to valuing farmland?

10.2. Interview questions for EIA respondents

Questions directly towards the environmental code

1. What do you consider to constitute an essential societal interest?
2. What do you consider to constitute agricultural land suitable for farming?
3. Do you consider the EIA to conform to chapter 3, section 12 point 3?
4. Do you consider the EIA to conform to chapter 3, section 12 point 5?
5. Do you consider the EIA to conform to chapter 3, section 12 point 7?
6. Do you consider the EIA to conform to chapter 3, section 12 point 8?

7. Do you consider that any of the points in chapter 3, section 12 need not be included with respect to chapter 3, section 13?
8. Could farmland conversion in Sweden cause significant environmental impact in another country?

Environmental policy

1. To you consider farmland in physical planning to be linked to the environmental quality objective 'A varied agricultural landscape'?
2. Do you consider farmland in physical planning to be linked to any other environmental quality objective?

General questions

1. Do you see any long term threats to food security in Sweden?
2. Do you see any ethical aspect in preserving farmland?
3. Do you believe that farmland conversion could lead to increased transportation of food?
4. Do you think that farmers are in need of long planning horizons?

Concluding question

1. What, if anything, do you perceive as difficult with regards to valuing farmland?

10.3. Interview questions for CAB respondents

1. What do you consider to constitute an essential societal interest?
2. What do you consider to constitute agricultural land suitable for farming?
3. Do you believe that municipalities are capable of valuing their farmland in a national perspective?
4. To you consider farmland in physical planning to be linked to the environmental quality objective 'A varied agricultural landscape'?
5. Do you consider farmland in physical planning to be linked to any other environmental quality objective?
6. Could farmland conversion in Sweden cause significant environmental impact in another country?
7. Have you ever notified, or considered notifying, the government about the need for municipal reporting on the management of land and water?
8. At what level of municipal planning to you think that the main tradeoffs with regards to farmland should be made?
9. Do you see any ethical aspect in preserving farmland?
10. Do you see any long term threats to food security in Sweden?
11. Do you consider the CAB to have fully utilized the review statement to highlight/emphasize the value of farmland?
12. What, if anything, do you perceive as difficult with regards to valuing farmland?